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REDESCRIPTION OF SOME CAVERNICOLOUS PSEUDOSCORPIONS (ARACHNIDA, CHELONETHIDA) IN THE COLLECTION OF THE MUSEUM OF COMPARATIVE ZOOLOGY

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Through the courtesy of Dr. H. W. Levi, the author was able to examine the collections of pseudoscorpions in the Museum of Comparative Zoology at Harvard College. The material considered in this paper was discovered among undetermined collections and recognized as type material by the characteristics mentioned in the treatment of the individual species. Included here are the types of three little-known, cavernicolous forms, *Blothrus packardi* Hagen, 1879, *Chthonius coccus* Packard, 1884, and *Obisium cavicola* Packard, 1884. Detailed redescriptions of these species based on mounted specimens are presented. In addition, the specimens from Mammoth Cave, Kentucky, considered conspecific with *B. packardi* (from Wyandotte Cave, Indiana) by Hagen, Packard and others, are separated from that species and made the basis of a new species.

Suborder HETEROSPILYRONIDA Chamberlin

Family CHTHONIIDAE Hansen

Subfamily CHTHONINAE Daday

Tribe CHTHONINI Chamberlin

Genus KLEPTOCHTHONIUS Chamberlin

Subgenus CHAMBERLINOCHTHONIUS Vachon

KLEPTOCHTHONIUS (CHAMBERLINOCHTHONIUS) PACKARDI

(Hagen), new combination

Blothrus packardii Hagen, 1879, Zool. Anz., vol. 2, p. 399.*Chthonius packardii* [pro parte]: Hubbard, 1880, Amer. Ent., vol. 3, p. 83.*Chthonius packardii* [pro parte]: Packard, 1888, Mem. Natl. Acad. Sci. Washington, vol. 4, p. 43.*Chthonius packardii* [pro parte]: Banks, 1895, Jour. New York Ent. Soc., vol. 3, p. 13.*Chthonius? packardii*: Beier, 1932, Das Tierreich, vol. 57, p. 61.*Genus? packardii*: Hoff, 1949, Bull. Illinois Nat. Hist. Surv., vol. 24, p. 443.*Chthonius? packardii*: Hoff, 1958, Amer. Mus. Novitates, no. 1875, p. 4.

Material: The type collection, consisting of 5 males and 1 female, was identified by a label reading "Wyandotte Cave, Ind." in the presumed handwriting of H. Hagen. Another female specimen with the label "Wyandotte New Cave, Packard" is taken to be that specimen mentioned by Packard (1888, p. 44). All of these specimens, with the exception of one male from the type collection, were mounted on slides for study. One of the mounted males has been designated the lectotype. Although Packard and Hubbard have given fairly accurate general descriptions (cf. Packard, 1888, p. 43-45), a redescription based on the mounted specimens is desirable.

Diagnosis: Male: (Measurements are given first for the lectotype, while in parentheses are given the ranges for the three paratypes.) Body and appendages generally of chthoniid facies but more slender than in epigeian species (see Packard, 1888, fig. 12, p. 45); lightly sclerotized and very light brown in color, the chelicerae and palps a little darker than other parts. Carapace nearly square in dorsal outline, the lateral margins usually a little convex; surface lightly sculptured; no epistome; no eyes or eye spots; total setae 16 (15-18), of which 3 (2-4) are on the anterior margin and 2 (2-3) near the posterior margin. Abdomen elongate; tergal and sternal scuta entire and smooth; pleural membranes very finely granulate; tergites of lectotype with 2:2:2:2:4:4:6:6:6:2 long, acuminate setae, paratypes with 2-3:2-3:2-3:2-4:4:4:5-6:6:6:2-5 setae; sternites 4-8 with 7-10 acuminate setae, shorter and more slender than those of the tergites.

Chelicerae generally of chthoniid size and proportions; hand with 7 setae; fixed finger with a row of 6-9 teeth, the movable finger with a row of 4-7 teeth, the teeth of each finger being heavy and triangular and becoming progressively lower and

smaller toward the proximal end of the finger; no isolated subdistal tooth on either finger; the galea represented by a small, but distinct, elevation; galeal seta distal to the midpoint of the finger; serrula exterior with about 18 teeth; flagellum of 8 unilaterally branched setae.

Palps long and slender; surfaces smooth; setae long and acuminate; general proportions of podomeres shown in Figure 1; chelal hand rather long and narrow, fingers long and gently curved; tactile setae as shown in Figure 2; fixed finger with a marginal row of alternating large and small teeth — 28 (28-29) widely-spaced large, acutely triangular teeth and 20 (20-22) small, low, triangular teeth between; movable finger distally with teeth similar to those on fixed finger, 17 (16-21) large and 16 (14-18) small, while proximally the teeth abruptly become low, rounded and contiguous, 11 (9-11) in number; proximal end of the movable finger with a long cylindrical process from its dorso-median border, parallel with the long axis of the finger and extending well beyond the proximo-ventral margin (this projection apparently serves for broader attachment of the muscles which move the finger and provides increased leverage). Trochanter 1.9 (1.7-2.0), femur 7.2 (7.1-7.2), tibia 2.5 (2.4-2.7), chela 7.6 (7.6-8.0) and hand 3.0 (2.8-3.1) times as long as broad; movable finger 1.69 (1.61-1.69) times as long as hand.

Legs generally of chthoniid form but elongate and slender. First leg with coxa bearing spines as characteristic of the genus, 5 (7) on the right coxa and 6 (6-8) on the left; fourth leg with tactile setae on tibia 0.40 (0.39-0.41), on metatarsus 0.24 (0.23-0.28), and on telotarsus 0.16 (0.21-0.26) the length of the segment from the proximal end.

Genitalia essentially as figured by Chamberlin (1931, fig. 50E) for *K. crosbyi*, and Vachon (1952, fig. 2) for *K. henroti*; about 15 setae on the anterior operculum; 10-12 setae on each side of the aperture; 7-8 setae on the posterior operculum between the spiracles.

Female: (The first measurements given are those for the female from Hagen's type series, which is designated the allotype, while in parentheses are given those for the specimen from "Wyandotte New Cave.") The female is essentially similar to the male except for slightly larger size. Carapace with a total of 16 (17) setae, of which 4 are on the anterior margin and 2 (3) at the posterior margin; no eyes or eye spots. Abdominal

tergites with 2:2:2:3:4:4:5:6:6:2 (2:2:3:4:4:6:4:6:6:4) setae; sternites with 6-10 setae.

Chelicera slightly larger than in the male; galea somewhat larger and more distinct than in the male, though not so sharply set off from the finger as indicated by Packard (1888, fig. 12d).

Palps like those of the male but slightly larger; fixed finger with 29 (29) large and 21 (20) small teeth; movable finger with 20 (18) large and 16 (14) small teeth distally and 10 (11) low, rounded teeth proximally; trochanter 1.8 (1.9), femur 7.0 (6.7), tibia 2.6 (2.5), chela 7.6 (7.1) and hand 2.9 (2.7) times as long as broad; movable finger 1.67 (1.64) times as long as hand.

Legs as in the male but slightly larger. Coxal spines 7 (6) on the right coxa and 7 (6) on the left. Leg IV with tactile setae on tibia 0.42 (0.40), on metatarsus 0.22 (0.24) and on telotarsus 0.20 the length of the segment from the proximal margin.

Genitalia essentially as figured by Chamberlin (1931, fig. 52A) for *Chthonius ischnocheles* but with setae of anterior operculum grouped more toward the midline and the row of setae on the posterior operculum extending farther lateral on each side; anterior operculum with 10 irregularly grouped setae; posterior operculum with a row of 6 (8) setae between the spiracles.

Measurements (in mm.): Male lectotype and paratypes (range of latter in parentheses): Body length 1.97 (1.79-1.89); carapace 0.60 (0.55-0.58) long, greatest width 0.57 (0.55-0.57); abdomen 0.73 (0.80-0.88) broad. Chelicera 0.45 (0.45-0.47) by 0.22 (0.20-0.23). Palpal trochanter 0.26 (0.23-0.27) by 0.14 (0.13-0.14); femur 0.90 (0.90-0.93) by 0.12 (0.12-0.13); tibia 0.34 (0.33-0.34) by 0.14 (0.12-0.14); chela 1.32 (1.29-1.33) by 0.18 (0.16-0.18); hand 0.50 (0.50-0.51) by 0.17 (0.16-0.18); movable finger 0.84 (0.83-0.84) long; proximal process of movable finger 0.033 (0.039-0.043) long. Leg I: basifemur 0.56 (0.55-0.57) by 0.08 (0.08); telofemur 0.23 (0.23-0.25) by 0.07 (0.07); tibia 0.28 (0.29-0.31) by 0.06 (0.06); tarsus 0.59 (0.58-0.60) by 0.05 (0.05-0.06). Leg IV: entire femur 0.77 (0.76-0.80) long; basifemur 0.28 (0.30-0.31) by 0.21 (0.18-0.23); telofemur 0.55 (0.53-0.57) by 0.19 (0.16-0.20); tibia 0.51 (0.51-0.54) by 0.10 (0.09-0.10); metatarsus 0.25 (0.25-0.26) by 0.07 (0.07); telotarsus 0.66 (0.64-0.66) by 0.06 (0.05-0.06).

Female allotype and paratype (latter in parentheses): Body length 1.94 (1.89); carapace 0.59 (0.61) long, greatest width 0.61 (0.60); abdomen 0.88 (0.84) broad; chelicera 0.50 (0.48) by 0.23 (0.22). Palpal femur 0.96 (0.98) by 0.14 (0.15); tibia

0.36 (0.37) by 0.14 (0.15); chela 1.39 (1.40) by 0.18 (0.20); hand 0.53 (0.54) by 0.18 (0.20). Movable finger 0.88 (0.88) long; proximal process of movable finger 0.045 (0.043) long. Leg I: basifemur 0.57 (0.57) by 0.08 (0.09); telofemur 0.24 (0.24) by 0.07 (0.08); tibia 0.31 (0.31) by 0.07 (0.07) and tarsus 0.58 (0.61). Leg IV: entire femur 0.81 (0.82) long; basifemur 0.30 (0.32) by 0.22 (0.23); telofemur 0.58 (0.58) by 0.20 (0.21); tibia 0.54 (0.56) by 0.10 (0.10); metatarsus 0.26 (0.25) by 0.07 (0.08); telotarsus 0.66 by 0.06.

Remarks: This species is restricted to the type locality as far as is known at present. The specimens from Mammoth Cave, Ky., and vicinity recorded as *Chthonius packardi* by Hagen, Packard, and others, actually belong to *Kleptochthonius cerberus* Malcolm and Chamberlin or to *K. hageni* n. sp. (see below). This species and *K. gertschi* Malcolm and Chamberlin are unique in the genus in the complete absence of eyes or eye spots. These two species may be differentiated readily by the number of setae of the cheliceral hand (7 in *packardi*, 9 in *gertschi*) and the number of setae at the posterior border of the carapace (2 in *packardi*, 6 in *gertschi*).

KLEPTOCHTHONIUS (CHAMBERLINOCHTHONIUS) HAGENI
new species

Material: Holotype male and allotype "with a dead bat" at bottom of Mammoth Dome, Edmonson Co., Ky., collected Sept. 11, 1874 by F. W. Putnam. Male paratype from Mammoth Cave, Edmonson Co., Ky. (no other data). Female paratypes from Mammoth Cave collected by A. S. Packard (?), Apr. 30, 1874, and by L. Hubricht, Dec. 15, 1956, and from Long Cave, Glasgow Junction, Ky., collected by F. G. Sanborn, Nov. 5, 1874.

Diagnosis: Male: (Measurements are given first for the holotype, while in parentheses are given those for the male paratype.) Body and appendages generally of chthoniid facies but more slender than in epigeal species; lightly sclerotized and pale brown in color, the chelicerae and palps somewhat darker than the body and legs. Carapace nearly square in dorsal outline, the lateral margins a little convex; no epistome; 2 eyes present in the anterior position with moderately well-developed corneas; no trace of posterior eyes or eye spots; total setae 20, of which 6 are on the anterior margin and 4 are situated near the posterior margin; surface generally smooth, but lightly sculptured on the sides. Abdomen elongate; tergal and sternal scuta entire and

smooth; pleural membranes weakly marked with fine granulations. Tergites of holotype with 2:2:2:3:5:4:6:6:7:7 long acuminate setae, paratype with 2:3:4:4:5:5:6:6:8:6 setae; sternites 4-8 with 8-11 acuminate setae, shorter and more slender than those of the dorsum.

Chelicera of chthoniid facies; hand with 7 setae; fixed finger with a row of 8-10 teeth, the movable finger with a row of 5-6 teeth, the teeth of each finger being generally heavy and triangular but becoming progressively smaller toward the proximal end of the row; no isolated sub-distal tooth on either finger; the galea represented by a low elevation on the movable finger; galeal seta distal to the midpoint of the finger; serrula exterior with about 18 teeth; flagellum consisting of 8 unilaterally branched setae.

Palps long and slender; surfaces smooth; setae long and acuminate; general proportions of podomeres shown in Figure 3; tactile setae of chela as shown in Figure 4; fixed finger of chela with a marginal row of alternating large and small teeth: 44 (39) large, acutely-pointed, widely-spaced teeth with 20 (18) tiny, rounded teeth between. Movable finger distally with teeth similar to those on the fixed finger, 30 (29) large teeth and 20 (10) tiny teeth between, while proximally the teeth abruptly become low, rounded and contiguous, 7 (7) in number; proximal end of the movable finger with only a short, broad projection from the dorso-median border, not extending beyond the proximo-ventral margin. Trochanter 2.0 (2.2), femur 6.9 (6.4), tibia 2.3 (2.1), chela 7.1 (6.8), and hand 2.8 (2.6) times as long as broad; movable finger 1.62 (1.66) times as long as the hand.

Legs generally of chthoniid facies but elongate and slender. First leg with coxa bearing spines as characteristic of the genus, 7 (8) on the right and 8 (8) on the left coxa; fourth leg with tactile setae on tibia 0.38 (0.38), on metatarsus 0.24 (0.23) and on telotarsus 0.26 (0.20) the length of the segment from the proximal end.

Genitalia essentially as in other species of the genus; with 12-15 setae on the anterior operculum; 7-12 setae on each side of the aperture; and 6-9 setae on the posterior margin of the 4th sternite between the spiracles.

Female: (The first measurements given are those for the allotype, while in parentheses are given the ranges for the three paratype females.) The female is essentially similar to the male. Carapace with a total of 20 (19-20) setae, of which 6 (5-6) are at the anterior margin and 4 (3-4) near the posterior margin;

2 eyes in the anterior position with moderately well developed corneas; no trace of eyes or eye spots at the posterior position. Abdominal tergites with 2:2:3:4:4:6:6:6:?:?:(2:2:2-4:3-4:4:5-6:6:6-7:6-7:4-6) setae; sternites with 8-12 setae.

Chelicera similar to that of the male; 7 (7) setae on the hand; galeal tubercle somewhat larger and more distinct than that of the male. Palps as in the male but somewhat larger and heavier. Fixed finger with 40 (37-39) large and 19 (15-17) small teeth; movable finger with 28 (25-27) large and 15 (15-17) small teeth distally and 7 (7-9) low, rounded teeth proximally. Trochanter 2.0 (1.9-2.0), femur 6.7 (6.3-6.6), tibia 2.3 (2.3), chela 6.7 (6.2-6.7) and hand 2.7 (2.4-2.7) times as long as broad; movable finger 1.63 (1.59-1.64) times as long as hand.

Legs as in the male; coxal spines 6 (7-9) on the right coxa and 7 (6-9) on the left. Leg IV with tactile setae on tibia 0.37 (0.29-0.36), on metatarsus 0.27 (0.26-0.29) and on telotarsus 0.28 (0.23-0.27) the length of the segment from the proximal margin.

Genitalia essentially as in *K. packardii*; anterior operculum with 9 (8-9) grouped setae; posterior operculum with a marginal row of 8 (7-8) setae between the spiracles.

Measurements (in mm.): Male holotype and paratype (latter in parentheses): Body length 2.14 (2.08); carapace 0.65 (0.62) long, greatest width 0.64; abdomen 0.84 (0.95) broad. Chelicera 0.56 (0.53) by 0.26 (0.25). Palpal trochanter 0.31 (0.31) by 0.16 (0.15); femur 1.06 (0.99) by 0.15 (0.15); tibia 0.41 (0.37) by 0.18 (0.18); chela 1.50 (1.45) by 0.21 (0.21); movable finger 0.96 (0.92) long; proximal process of movable finger 0.020 (0.016) long. Leg I: basifemur 0.63 (0.60) by 0.09 (0.09); telofemur 0.25 (0.25) by 0.08 (0.08); tibia 0.32 (0.33) by 0.07 (0.07); tarsus 0.64 (0.62) by 0.06 (0.06). Leg IV: entire femur 0.93 (0.86) long; basifemur 0.36 (0.34) by 0.28 (0.25); telofemur 0.66 (0.64) by 0.25 (0.23); tibia 0.60 (0.58) by 0.11 (0.11); metatarsus 0.31 (0.29) by 0.09 (0.09); telotarsus 0.74 (0.69) by 0.06 (0.06).

Female allotype and three paratypes (ranges of latter in parentheses): Body length 2.20 (2.30-2.55); carapace 0.60 (0.62-0.67) long, greatest width 0.60 (0.58-0.71); abdomen 0.95 (0.80-1.09) broad. Chelicera 0.56 (0.58-0.64) by 0.26 (0.27-0.29). Palpal femur 1.03 (1.05-1.18) by 0.15 (0.17-0.18); tibia 0.40 (0.42-0.46) by 0.18 (0.18-0.20); chela 1.48 (1.53-1.72) by 0.22 (0.23-0.28); hand 0.58 (0.58-0.67) by 0.21 (0.22-0.28); movable finger 0.94 (0.94-1.07) long; proximal process of movable finger 0.019

(0.017-0.025). Leg I: basifemur 0.60 (0.64-0.72) by 0.09 (0.09-0.10); telofemur 0.26 (0.26-0.31) by 0.08 (0.08-0.09); tibia 0.31 (0.31-0.36) by 0.07 (0.07); tarsus 0.62 (0.64-0.72) by 0.06 (0.06-0.07). Leg IV: entire femur 0.87 (0.94-1.00) long; basifemur 0.34 (0.36-0.37) by 0.25 (0.26-0.34); telofemur 0.62 (0.66-0.75) by 0.23 (0.23-0.30); tibia 0.57 (0.62-0.69) by 0.11 (0.11-0.13); metatarsus 0.30 (0.31-0.37) by 0.08 (0.09-0.10); telotarsus 0.72 (0.71-0.83) by 0.06 (0.06-0.07).

A deutonymph is at hand which probably pertains to this species. It was collected in Audubon Avenue, Mammoth Cave, Kentucky, by L. Hubricht on Dec. 15, 1956. It is of interest to note some points of difference evidently associated with immaturity. The appendages are all considerably stouter than those of the adults. Only 18 setae are present on the carapace, with 6 at the anterior edge and 2 at the posterior. Two coxal spines are present on each coxa I and the discal seta is wanting. The galeal tubercle is small but distinct (as in the adult). There are only 6 blades in the flagellum and only 5 setae on the cheliceral hand. The movable finger of the chela has only two setae (probably *st* and *sb*), while the fixed finger is lacking *ist* and one seta from the dorsum of the hand.

Remarks: This material from Mammoth Cave was considered by Hagen, Packard, and other early workers to be conspecific with *K. packardi* from Wyandotte Cave, Indiana, although they remarked the presence of eyes in the former and their absence in the latter. Later workers have been sceptical of this relationship (cf. Hoff, 1958, p. 4; Chamberlin and Malcolm, 1960, p. 111), but only recently has material become available to clarify the situation. Restudy of the type material has made obvious the differences between the Indiana specimens and those described here as *K. hageni*. *K. hageni* can be distinguished from *K. cerberus* Malcolm and Chamberlin, which it closely resembles, by the possession of small, but distinct, microdenticles between the macrodenticles of both fixed and movable chelal fingers, by the possession of a small but distinct galeal tubercle, and by the smooth inner edge of the movable cheliceral finger distal to the row of teeth.

In addition there are a number of other specimens from Mammoth Cave and vicinity, collected by Packard and others, and more recently by T. C. Barr, Jr., L. Hubricht, and C. Krekeler, which differ from the described forms in certain details, particularly number of eyes, chaetotaxy, and proportions of the proximal

process of the movable chelal finger. The relations of these forms to *K. hageni* and to the cave species recently described by Malcolm and Chamberlin (1961) will be treated in a later paper.

This species is named in honor of H. A. Hagen who initiated the study of cave pseudoscorpions in the United States.

Genus APOCHTHONIUS Chamberlin

APOCHTHONIUS COECUS (Packard), new combination

Chthonius coecus Packard, 1884, Amer. Nat., vol. 18, p. 203; 1888, Mem. Natl. Acad. Sci. Washington, vol. 4, p. 46.

Chthonius? coecus: Beier, 1932, Das Tierreich, vol. 57, p. 61.

Chthonius? coecus: Hoff, 1958, Amer. Mus. Novitates, no. 1875, p. 4.

Material: The two type specimens in the collection of the M.C.Z. have been mounted on slides for study. They are a male, which has been designated the lectotype, and a female, the allotype. Both were collected by Packard in Weyer's Cave (Grand Caverns), Augusta Co., Virginia, in 1874. The descriptions of the species by Packard (1884, 1888) are generally accurate, but a detailed description based on the mounted specimens is desirable. It is obvious that the species belongs in *Apochthonius*.

Diagnosis: Male lectotype: Body and appendages typical of the genus; very lightly sclerotized and pale brownish in color, the chelicerae and palps being slightly darker than the body and legs. Carapace slightly broader than long, being slightly narrower toward the posterior end; no epistome; no eyes or eye spots; total setae 22, of which 8 are at the anterior margin and 4 near the posterior margin; surface smooth. Abdomen longer than broad and smoothly rounded in outline; tergal and sternal scuta entire and smooth; pleural membranes very faintly, longitudinally striate. Tergal chaetotaxy 4:4:5:6:6:7:7:8:8:6; sternites with 8-10 setae.

Chelicera large and heavy, typical of the genus; hand with 7 setae; fixed finger with a row of 7 triangular teeth which become progressively smaller toward the base; movable finger with a row of 7-8 similar teeth and an additional tooth situated half way between the distal end of the row and the tip of the finger; galea represented by a low but distinct elevation.

Left palp of typical facies (right palp missing); general proportions of podomeres shown in Figure 5; tactile setae of chela as shown in Figure 6; fixed finger with a marginal row of 72 nearly contiguous teeth, which are tall and rectangular at the

distal end of the row, becoming low and broadly rounded toward the proximal end; movable finger with 71 similar teeth. Trochanter 1.8, femur 4.5, tibia 1.9, chela 5.5, and hand 1.7 times as long as broad; movable finger 2.27 times as long as the hand.

Legs of typical facies. First leg with coxa bearing spines as characteristic of the genus, with 2 spines on the right coxa and 3 on the left. Fourth leg with tactile setae on tibia 0.46, on metatarsus 0.25, and on telotarsus 0.20 the length of the segment from the proximal margin.

Genitalia as in other members of the genus; anterior operculum with an irregular group of 6 setae anteriorly and a row of 9 setae along the posterior margin; posterior operculum with 7 setae on each side of the aperture and a marginal row of 8 setae between the spiracles.

Female allotype: Essentially similar to the male. Carapace with a total of 22 setae of which 8 are at the anterior margin and 4 near the posterior border; no eyes or eye spots. Abdominal tergites with 4:4:6:6:6:7:7:8:?:?: setae.

Right chelicera missing; left apparently similar to that of male.

Right palp missing; left palp similar to that of male. Fixed chelal finger with 72 teeth and movable finger with 70 teeth. Trochanter 1.9; femur 4.8; tibia 1.8; chela 4.9 and hand 1.6 times as long as broad; movable finger 2.12 times as long as hand. Legs as in the male. Leg I with 3 spines on each coxa. Leg IV with tactile setae on tibia 0.46, on metatarsus 0.31, and on telotarsus 0.24 the length of the segment from the proximal margin.

Genitalia essentially the same as for *K. packardi*; anterior operculum with 8 grouped setae; posterior operculum with 7 setae in a row between the spiracles.

Measurements (in mm.): Male lectotype and female allotype (latter in parentheses): Body length 1.13 (1.07); carapace 0.40 (0.41) long, greatest width 0.44 (0.44); abdomen 0.51 (0.51) broad. Chelicera 0.36 (0.38) by 0.18 (0.18). Palpal trochanter 0.18 (0.20) by 0.10 (0.10); femur 0.43 (0.46) by 0.10 (0.10); tibia 0.22 (0.23) by 0.12 (0.12); chela 0.68 (0.72) by 0.12 (0.15); hand 0.21 (0.23) by 0.12 (0.15); movable finger 0.48 (0.50) long. Leg I (missing in female): basifemur 0.24 by 0.05; telofemur 0.12 by 0.05; tibia 0.14 by 0.04; tarsus 0.26 by 0.04. Leg IV: entire femur 0.35 (0.36) long; basifemur 0.17 (0.17) by 0.15 (0.15); telofemur 0.23 (0.23) by 0.12 (0.13); tibia 0.26

(0.27) by 0.07 (0.07); metatarsus 0.12 (0.12) by 0.05 (0.05); telotarsus 0.26 (0.25) by 0.04 (0.04).

Remarks: This is the first species of *Apochthonius* known to be cavernicolous. Unlike the troglobious species of *Kleptochthonius* it is not markedly modified for life in caves. It is generally similar to the epigean species, *A. moestus*. From this it differs in the following respects: no trace of eyes; derm less heavily sclerotized and lighter in color; slightly more slender palpal podomeres; slightly reduced chaetotaxy of the carapace and the abdominal tergites.

It is pertinent at this point to mention that we have at hand a tritonymph collected in Madison Cave, Augusta Co., Virginia, Aug. 23, 1958 by T. C. Barr, Jr. This specimen is perhaps referable to *A. coccus*, since Madison Cave is close to Weyer's cave. It is similar in most details to the type adults, but with numbers and measurements somewhat reduced as would be expected of a tritonymph. Unexpectedly, however, this individual clearly possesses two eyes in the anterior position, weakly but definitely corneate. The explanation of this situation is not certain. It may be that this nymph belongs to a separate, new species. Or it may be that the species, *A. coccus*, may contain individuals both with and without eyes. A third possibility is that nymphs of *A. coccus* possess eyes which are then lost at the adult molt (as is suggested for *Chitrella archeri* below). Only study of larger, as yet uncollected, series of specimens can throw further light on this problem.

Suborder DIPLOSPHYRONIDA Chamberlin

Family SYARINIDAE Chamberlin

Subfamily CHITRELLINAE Beier

Genus CHITRELLA Beier

CHITRELLA CAVICOLA (Packard), new combination.

Obisium cavicola Packard, 1884, Amer. Nat., vol. 18, p. 202.

Obisium cavicola: Packard, 1888, Mem. Natl. Acad. Sci. Washington, vol. 4, p. 42.

Microcreagris? cavicola: Beier, 1932, Das Tierreich, vol. 57, p. 157.

Microcreagris? cavicola: Hoff, 1958, Amer. Mus. Novitates, No. 1875, p. 12.

The specimen upon which Packard based the species *Obisium cavicola* was preserved in the M.C.Z. with a label bearing only the notation "New Market Cave, Packard." There can be no

doubt that it is the specimen in question, inasmuch as it retained the peculiar pose of the appendages and outline of body as depicted in Paekard's illustrations (1884, fig. 1, and 1888, fig. 11). The figure and description are, however, at variance with the specimen in two major respects: 1) there is no cleft in the carapace, which is, indeed, perfectly normal; and 2) there are actually four eyes present with distinct, albeit weak, corneas. In the alcoholic specimen the illusion of a cleft carapace was given at first glance, due to the transparency of the carapace and the converging medial borders of the rather opaque cheliceral muscles. It is difficult to understand how the eyes could have been overlooked since they were readily visible in the alcoholic specimen. The specimen was mounted on a slide for detailed study. It was revealed to be a tritonymph of a species belonging in the genus *Chitrella* Beier. It is regrettable but necessary to base the description of the species upon this single, immature specimen.

Diagnosis: Tritonymph holotype: Body and appendages of typical chitrelline facies (cf. Malcolm and Chamberlin, 1960, fig. 4); very lightly sclerotized and pale in color; carapace slightly longer than broad, with its greatest breadth at about the middle; no epistome; four eyes weakly but definitely corneate; total setae 28, of which 6 are on the anterior margin and 6 at the posterior margin. Abdomen elongate; tergal and sternal scuta entire; pleural membranes longitudinally striate. Tergal chaetotaxy: 9:11:11:11:12:13:13:11:8:?. Sternal chaetotaxy 3:(3)8(3):(3)8(3):12: $\frac{2m}{13}$: 15:14:12:12:?, the two microsetae of sternite 6 lying side by side at the center of the scutum.

Chelicera typical, about twice as long as broad; chaetotaxy normal, with 5 setae on hand and a galeal seta; flagellum apparently consisting of 6 or 7 blades; fixed finger with 16-18 triangular teeth, largest in the middle of the row; movable finger with 8-10 irregular teeth, very heavy distally but smaller toward the base of the finger; galea absent.

Palps typical, showing no special adaptation to subterranean life; general proportions of podomeres as shown in Figure 7. Tactile setae of chela as shown in Figure 8; seta *isb* absent from the fixed finger and *sb* from the movable finger; fixed finger with a marginal row of 42 contiguous teeth, quadrangular in the distal third but low and rounded in the basal two-thirds of the row;

movable finger with 49 contiguous teeth, all low, broad and somewhat rounded. Trochanter 2.1; femur 3.8; tibia 2.4; chela 3.6, and hand 1.5 times as long as broad; movable finger 1.52 times as long as hand.

Legs generally typical of the genus but with the telotarsus of each leg swollen subbasally so that its depth is equal to or greater than that of the metatarsus. Leg IV with a tactile seta on the tibia 0.67 the length of the segment from the proximal margin; apparently no tactile seta present on the metatarsus.

Measurements (in mm.): Tritonymph holotype: Body length 1.90; carapace 0.48 long, greatest width 0.45; abdomen 0.81 broad. Chelicera 0.29 by 0.15. Palps: trochanter 0.26 by 0.12; femur 0.44 by 0.12; tibia 0.37 by 0.15; chela 0.72 (0.77 with pedicel) by 0.20; hand 0.30 by 0.19; movable finger 0.45 long. Leg I: basifemur 0.22 by 0.07; telofemur 0.15 by 0.07; tibia 0.20 by 0.05; metatarsus 0.11 by 0.044; telotarsus 0.15 by 0.047. Leg IV: entire femur 0.38 long; basifemur 0.15 by 0.13; telofemur 0.23 by 0.14; tibia 0.31 by 0.07; metatarsus 0.13 by 0.058; telotarsus 0.19 by 0.058.

Remarks: Though this species is presently known only from a single tritonymph some idea of the adult form may be surmised from a comparison with *C. archeri* Malcolm and Chamberlin, of which 3 tritonymphs have been studied (unpublished). In most respects the tritonymph of *C. cavicola* is similar to those of *C. archeri*, but it is a little smaller and slightly less slender both in body and in the appendages. It has fewer teeth on the chelal fingers (fixed finger 42 and movable finger 49 as compared with 49-54 and 56-58, respectively); it has 9 setae on the first tergal scutum as compared with 4-6; and tactile seta *t* of the movable chelal finger is slightly closer to the tip of the finger (index 0.328 as compared with 0.361-0.370). On the other hand, it shares with *C. archeri* tritonymphs the possession of two microsetae on the sixth sternite; the subbasal swelling of the telotarsi (unpublished observation; cf. also Vachon, 1954, p. 219); and (with one specimen) the lack of a tactile seta on metatarsus IV. Furthermore, it should be mentioned here that, while the adults of *C. archeri* are without demonstrable eyes, the tritonymphs possess definite, though weakly developed, corneas corresponding to, but weaker than, the anterior eyes of *C. cavicola*.

From the foregoing it seems warranted to assume that the adult of *C. cavicola* is similar to that of *C. archeri*, but slightly smaller and more robust and differing in details of chaetotaxy,

etc., and perhaps very close to the adult of *C. muesebecki* Malcolm and Chamberlin.

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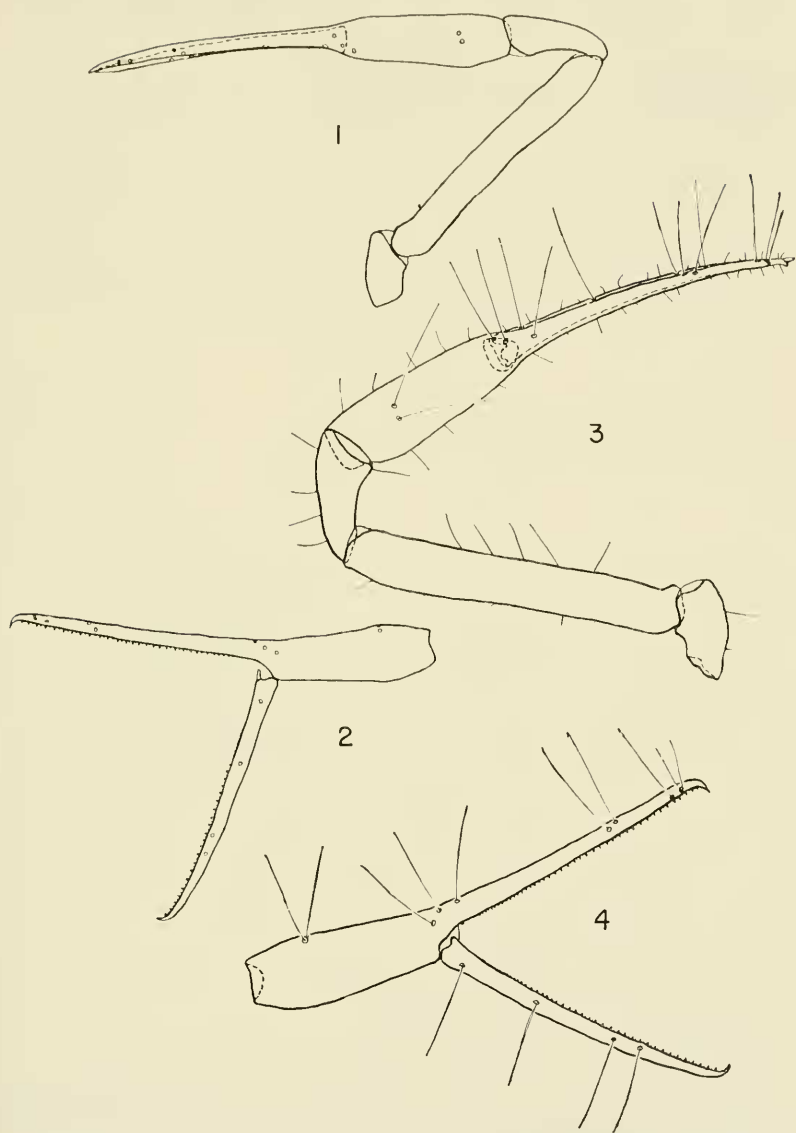
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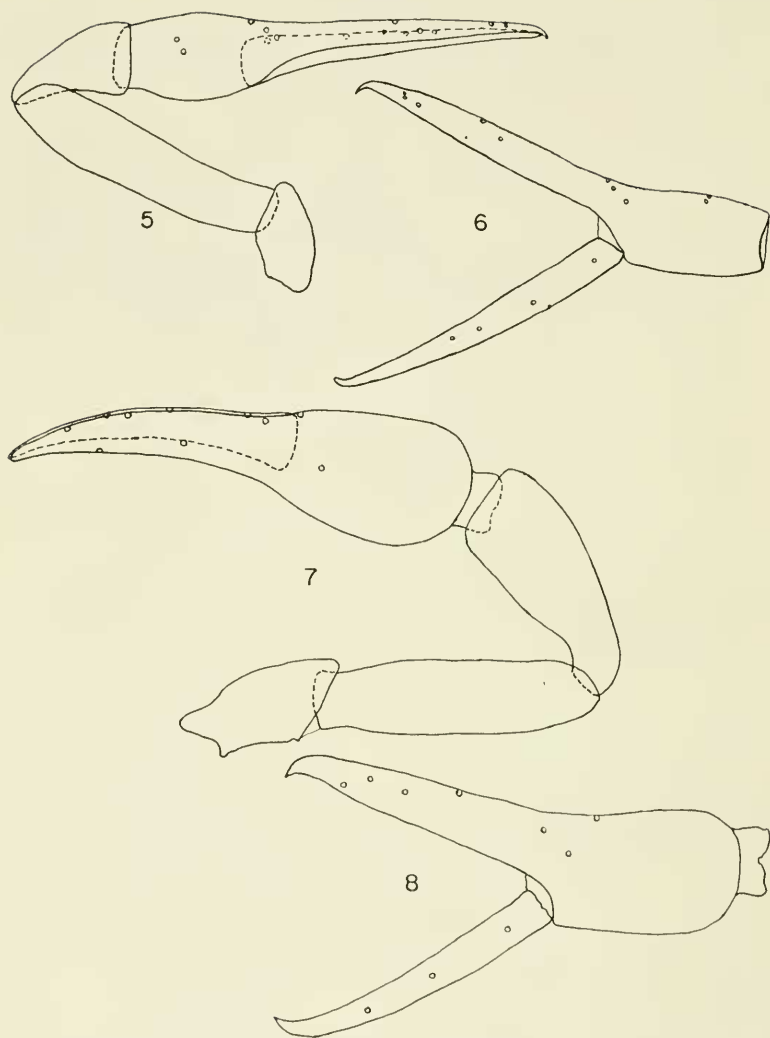
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Figures 1 and 2. *Kleptochthonius* (*Chamberlinochthonius*) *packardi* (Hagen), allotype female. 1. Dorsal view of right palp. 2. Lateral view of left chela (setae missing from specimen).

Figures 3 and 4. *Kleptochthonius* (*Chamberlinochthonius*) *hageni*, new species, holotype male. 3. Dorsal view of left palp. 4. Lateral view of right chela.



Figures 5 and 6. *Apochthonius coccus* (Packard), lectotype male. 5. Dorsal view of left palp. 6. Lateral view of left chela (setae missing from specimen and teeth omitted).

Figures 7 and 8. *Chitrella cavicola* (Packard), holotype tritonymph. 7. Dorsal view of right palp. 8. Lateral view of left chela (setae missing from specimen and teeth omitted).